REMARKS

Entry of the foregoing and reexamination and reconsideration of the subject application, as amended, pursuant to and consistent with 37 C.F.R. § 1.112, are respectfully requested in light of the remarks which follow.

Claims 1-33 are currently pending. Claims 8, 9, 15-27, 32 and 33 stand withdrawn as directed to non-elected subject matter.

Claims 5, 11 and 29 have been amended to clarify claimed subject matter. Claims 7, 13, 28 and 31 are amended herein to correct issues of grammar. Claim 3 has been amended to provide antecedent basis. Basis for these amendments may be found throughout the specification and claims as-filed especially at page 6, lines 4-8, page 13, lines 6-20 and the Examples at page 20, line 6 to page 32, line 11. Thus, no prohibited new matter is presented by the present Amendment.

Claim Objections

Claims 7, 13 and 31 are objected to because they purportedly lack an article before *"Arabidopsis"*. Claims 7, 13, and 31 have been amended to recite an article before *"Arabidopsis"*. Thus, Applicants respectfully submit that the objection to the claims has been obviated.

Rejections under 35 U.S.C. § 112, First Paragraph

Claims 1-7, 10-14 and 28-3 1 stand rejected under 35 U.S.C. § 112, first paragraph, because the specification, while being enabling for a vector encoding the *Arabidopsis* MinD protein, plants and cells transformed with it and a method of using it to produce a plant with one or few chloroplasts, purportedly does not reasonably provide enablement for vectors comprising a gene encoding a protein with the same functional activity as the *Arabidopsis* MinD protein or encoding a derivative of the *Arabidopsis* MinD protein, plants and cells transformed with them and a method of using them to produce a plant with one or few chloroplasts.

The instant specification purportedly fails to provide guidance for MinD genes derived from the *Arabidopsis MinD* gene. The instant specification purportedly also fails to provide guidance for which amino acids of SEQ ID NO:1 can be altered and to which other amino acids, and which amino acids must not be changed, to maintain MinD activity of the encoded protein. The specification also purportedly fails to provide guidance for which amino acids can be deleted and which regions of the protein can tolerate insertions and still produce a functional enzyme. Applicants respectfully traverse.

Applicants submit that the specification, combined with what was known in the art at the time the invention was filed, is enabling for the present claims. Specifically, there is enablement for vectors comprising a gene encoding a protein with the same functional activity as the *Arabidopsis* MinD protein or encoding a derivative of the *Arabidopsis* MinD protein, plants and cells transformed with them and a method of using them to produce a

plant with one or few chloroplasts. For example, the MinD database found at the NCBI website provides over 300 sequences with high homology to the MinD gene. Attached hereto is a printout from a BLAST search of MinD on the GenBank database (www.ncbi.nlm.nih.gov). As the results show, MinD has a COG (cluster of orthologous group of proteins), and thus MinD is very well recognized in prokaryotes. Therefore, the skilled artisan would know that MinD is similar across species and has the "signature" of a septum formation inhibitor-activating ATPase. Thus, Applicants submit that the genes in this database can easily be used by the skilled artisan to prepare primers, for example, and to identify appropriate derivatives of the MinD gene.

The specification also purportedly fails to provide guidance for which amino acids can be deleted and which regions of the protein can tolerate insertions and still produce a functional enzyme. Applicants submit that there is sufficient guidance as to which amino acids of SEQ ID NO:1 can be altered and to which other amino acids, and which amino acids must not be changed, to maintain MinD activity of the encoded protein. Specifically, based on the homology provided by the NCBI database as discussed above, Applicants submit that the skilled artisan would have sufficient guidance to know which amino acids to change and which amino acids not to change.

Claims 1-7, 10-14 and 28-31 stand rejected under 35 U.S.C. 112, first paragraph, as purportedly failing to comply with the written description requirement. The claims purportedly contains subject matter that was not described in the specification in such a way

as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention.

The claims are purportedly broadly drawn to a multitude of a vector encoding a derivative of the *Arabidopsis* MinD protein, methods of its use, and cells and plants comprising it. The Examiner argues that Applicant does not describe other DNA molecules encompassed by the claims, and the structural features that distinguish all such nucleic acids from other nucleic acids are not provided. The Examiner further argues that Applicant has not, in fact, described DNA molecules that encode a derivative of the *Arabidopsis* MinD protein within the full scope of the claims. Applicants traverse.

The appropriate vectors encoding a derivative of the *Arabidopsis* MinD protein, methods of its use, and cells and plants comprising it, would be easily determined by the skilled artisan through what was known in the art at the time the invention was filed. For example, the NCBI database provides the skilled artisan with the information needed to know which DNA molecules are encompassed by the claimed invention, or which sequences encode a derivative of the MinD protein.

Thus, Applicants request that these rejections be withdrawn.

Rejections under 35 U.S.C. § 112, Second Paragraph

Claims 1-7, 10-14 and 28-31 stand rejected under 35 U.S.C. 112, second paragraph, as purportedly indefinite. Claims 1, 5-7, 10-13 and 28-31 are purportedly indefinite in their recitation of "exogenous". It is purportedly unclear as to the meaning of

this term. Applicants submit that this term is well known to the skilled artisan as meaning developed outside the organism in question. In support Applicants provide a definition from *Stedman's Medical Dictionary*. In the case of the presently claimed invention, the phenotype is attributable to expression of a gene that is not part of the normal genome, but rather from an outside source. The Arabidopsis gene is an exogenous gene in tobacco, but not in Arabidopsis, although Colleti *et al.* and Kanamaru *et al.* placed the endogenous AtMinD under the expression of an exogenous promoter (CaMV 35S) that resulted in large chloroplasts in Arabidopsis.

Claims 1, 10 and 28 are purportedly indefinite for the recitation of "a protein with the same functional activity as a protein encoded by the *Arabidopsis thaliana* ... *MinD* gene". It is purportedly unclear as to which protein encoded by the *MinD* gene is referred to. Applicants submit that the skilled artisan would know what proteins and sequences encoding the proteins are appropriate in the context of the present invention, for example, from reviewing the sequence homologies found at the NCBI database.

Claim 3 purportedly lacks antecedent basis for the phrase "cells of Claim 2". Claim 3 has been amended to recite "a cell of claim 2" to provide antecedent basis. Thus, Applicants respectfully submit that the rejection to the claim has been obviated.

Claims 5, 11 and 29 are purportedly indefinite in their recitation of "gene is derived from *Arabidopsis thaliana*". It is purportedly unclear as to what it means for a gene to be derived from a plant. Claims 5, 11 and 29 have been amended herein to recite "derived from a gene of *Arabidopsis thaliana*". Thus, this rejection is obviated.

Claims 7, 13 and 31 are purportedly indefinite in their recitation of "gene is derived from *Arabidopsis thaliana MinD* gene". It is purportedly unclear as to how the gene differs from the *Arabidopsis* gene. Applicants submit that what is meant by "gene derived from" a MinD gene would be well known to the skilled artisan. This term is further defined on page 7, lines 19-25 of the specification.

Claim 28 is purportedly indefinite in its recitation of "effects" in line 5. Claim 28 has been amended to recite "affects". Thus, Applicants respectfully submit that the rejection to the claim has been obviated. Claims 28-31 stand rejected as purportedly incomplete for omitting essential steps. The method is one of producing a transgenic plant with one or few large chloroplasts. Purportedly, a step for selecting plants with the desired phenotype is required. Thus, independent claim 28 has been amended to recite this step. Thus, Applicants respectfully submit that the rejection to claims 28-31 has been obviated.

Rejections under 35 U.S.C. § 102

Claims 1-7, 10-13 and 28-3 1 stand rejected under 35 U.S.C. § 102(a) as purportedly anticipated by Colletti *et al.* (*Curr. Biol.*, 10: 507-516 (2000)).

Colletti *et al.* purportedly disclose vectors comprising the *Arabidopsis MinD* coding sequence in the sense or antisense orientation under control of the 35S promoter and *Arabidopsis* plants whose nuclear genome is transformed with the gene; these plants had large chloroplasts that were reduced in number. Seeds of transformed plants were

purportedly generated in the production of T1-T3 progeny. The *Arabidopsis MinD* coding sequence would purportedly be exogenous to the rest of the vector sequence. Applicants traverse.

This rejection, insofar as it applies to the claims as amended, is respectfully traversed. For proving anticipation, "anticipation requires the presence in a single prior art disclosure of all elements of a claimed invention as arranged in the claims." Jamesbury Corp. v. Litton Industrial Products, Inc. 225 U.S.P.Q. 253, 256 (Fed. Cir. 1985). The claims as amended now recite vectors comprising an exogenous gene which, when expressed, enhances and increases the efficacy of chloroplast transformation.

Thus, Colletti *et al.* do not recite all of the elements of the claimed invention. Applicants note that the present invention is not directed to the use of MinD to make larger chloroplasts. However, the present invention uses the pMidD in a heterologous system and on a different species, such as tobacco. Thus, the presently claimed invention, as amended herein, seeks to create a system which greatly increases the efficacy of transformation.

Specifically, the present invention provides a system able to increase the efficiency of chloroplast transformation. For example, a tobacco lines may be created using the present invention which contain one, or few, large chloroplasts in the cell, which increases the target area for particle bombardment transformation. Due to the presence of only a single or few chloroplasts per cell, the need for multiple transfers in tissue culture to increase the percentage of transgenic homoplastic cells in the regenerating shoot is eliminated. Thus, the multiple rounds of tissue culturing that can ultimately result in a

transplastomic plants with somaclonal variation is reduced, because there is no random assortment of the transgenic and non-transgenic chloroplasts in each cell. The present invention is able to apply selection pressure to achieve homoplastic cell lines via homologous recombination within each plastid genome to increase the number of transgenic DNA molecules. Once the transplastomic plant is recovered it is simple to return to normal chloroplast phenotype by taking away the overexpressed MinD transgene by crossing the transplastomic plant with normal plants and selecting for non-transgenic plants.

Colletti *et al.* do not recite all of the elements of the claimed invention, as this reference fails to recite the system of increased efficiency and methods of achieving same. Thus, the claims are not anticipated by Colletti *et al.*

Claims 1-7, 10-13 and 28-31 stand rejected under 35 U.S.C. § 102(a) as purportedly anticipated by Kanamaru *et al.* (*Plant Cell Physiol.*, 41: 1119-1128 (2000) and GenBank Accession No. AB030278 (December 2000)).

Kanamaru *et al.* purportedly disclose a vector comprising the *Arabidopsis MinD* gene under control of the 35S promoter and *Arabidopsis* plants whose nuclear genome is transformed with the gene; these plants had large chloroplasts that were reduced in number. The Office Action states that the seeds of transformed plants were generated in the production of 12 and T3 progeny.

Applicants submit that the presently claimed invention, as amended herein, is directed to a system which greatly increases the efficacy of transformation, rather than just

providing larger chloroplasts. This increased efficiency and methods of obtaining same is not disclosed in Kanamaru *et al.* Thus, the cited reference fails to recite every element of the claimed invention, and does not anticipate the claims.

Claims 1-2 and 5-7 stand rejected under 35 U.S.C. 102(b) as purportedly anticipated by Huang *et al.* (*J. Bacteriol.*, 178: 5080-5085 (1996)).

Huang *et al.* purportedly disclose expression vectors encoding a bacterial MinD protein and yeast cells comprising the vector, as the bacterial protein would have the same function as the *Arabidopsis* MinD protein. Applicants traverse. Again, Applicants submit that the presently claimed invention, as amended herein, is directed to a system which greatly increases the efficacy of transformation, rather than just providing larger chloroplasts. This increased efficiency and methods of obtaining same is not disclosed in Huang *et al.* Thus, the cited reference fails to recite every element of the claimed invention, and does not anticipate the claims.

CONCLUSION

In view of the foregoing, further and favorable action in the form of a Notice of Allowance is believed to be next in order. Such action is earnestly solicited.

In the event that there are any questions relating to this application, it would be appreciated if the Examiner would telephone the undersigned attorney concerning such questions so that prosecution of this application may be expedited.

Respectfully submitted,

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